

duce any very marked results on the parasite. The development of organs of adhesion is not greater than in the free-living species. Eyes may or may not be present, and the size of the pharynx varies with the species. The character shared by the largest number of representatives of these groups appears to be the loss of cilia, especially on the dorsal surface. There is hardly an indication of that increase in size of the genital glands so conspicuous in endoparasitic forms where the eyes and adhesive organs are frequently absent, the pharynx and nervous system much reduced, whilst the body, on the other hand, is invariably completely ciliated. As might be expected, the number of families represented in grades (2) and (3) is greater than the number of those which contain endoparasites; the majority of the latter belong to the Vorticidæ. The hosts most affected by parasitic Turbellaria are holothurians, crustacea, and mollusca. Other echinoderms, worms, tunicates, and vertebrates are also preyed upon to a lesser extent.

Von Graff makes some interesting comments on the classification of the platyhelminthes. The species of the genus *Temnocephala* usually regarded as transitional forms between the Turbellaria and monogenetic trematodes might, he points out, be referred with equal justice to the vorticid genus *Derostoma*. Again, *Fecampia*, when sexually ripe, agrees in characters of systematic importance with the cestodes. In fact, "the more thorough our knowledge of the platyhelminthes becomes, the more difficult it is to define the classes of the phylum. But just as so-called bad species are of value to the student of evolution, so these 'bad classes' of the flat-worms supply him with arguments which are the more convincing in that they rest on the sure ground of ascertained morphological facts."

The work concludes with a useful list of the very numerous parasites with which the Turbellaria themselves may be infected. These range from symbiotic algæ and bacteria to trematodes and nematodes. It is curious that the first recorded orthonectid, found by Keferstein in *Leptoplana tremellaris* thirty-five years ago, has not yet been adequately described. It differs considerably from the other orthonectids noticed since then.

F. F. LAIDLAW.

#### OUR BOOK SHELF.

*Applications of the Kinetic Theory to Gases, Vapours, and Solutions.* By W. P. Boynton, Ph.D. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1904.) Price 7s. net.

THERE are probably few mathematicians who can follow the long and difficult investigations by which it has been attempted to dispense with the second law, and to represent thermodynamical properties of matter as the changes which must necessarily take place in a molecular system for which the principles of dynamics and the laws of probability are assumed to hold good. Such attempts have been found practically in every case to involve some *further* assumption, whenever a kinetic theory has been applied to the consideration of irreversible phenomena, and Mr. Burbury has unearthed this inevitable assumption when it has escaped the attention of writers of several

recent papers. It is probably as impossible to build up an irreversible thermodynamical system out of reversible dynamical elements without any assumption as it is to build up a Euclidean geometry without some axiom of parallels.

But apart from such considerations as this, a kinetic theory is of considerable use to the ordinary physicist in furnishing him with a mechanical representation of the properties of matter in its various states. Dr. Boynton has taken as his standard the requirements of a reader who is familiar with the elements of the calculus, and he has produced a book which will be of great value to students both of physics and of chemistry.

It is perhaps unfortunate that those English physicists who are most competent to write books like the present one are usually too much tied down by other duties to undertake such work, especially as the task is in most instances an unprofitable one to the author. It is therefore satisfactory to find that Dr. Boynton's book is written so much on the lines of an English text-book that it seems well suited for introduction into this country. The features which we particularly like are, firstly, that the author is careful to give his readers no excuse for believing he has proved a result when he has only given an elementary investigation of it, and secondly, that instead of introducing irrelevant philosophical digressions or views of his own, he has kept strictly to an exposition of commonly accepted theories.

It is much to be wished that the same could be said of all the books which find their way into our class-rooms from the other side of the water. It is because they do not generally come up to the present standard of excellence that the difficulty of writing English text-books that are worth writing is to be regretted.

G. H. B.

*Handbuch der Physik.* By Dr. A. Winkelmann. Second Edition. First part of vol. iv., Electricity and Magnetism. 140 figures. Price 12 marks. First part of vol. vi., Optics. 170 figures. Price 14 marks. (Leipzig: Barth, 1904.)

EVERY student of physics will share the satisfaction of the editor of this treatise that a second edition was called for so soon; for he has found it to be an indispensable storehouse of expert knowledge in all branches of the subject, and the need for another edition enables it to be brought once more abreast of the rapidly advancing tide of knowledge.

The book is of the nature of an encyclopædia, for each section is written by an expert in the section; twenty-two of the leading physicists of Germany collaborate in this way with Dr. Winkelmann, the editor, in its production. Of the two parts before us, that on electricity and magnetism is contributed by Drs. Graetz and Auerbach, while the part on optics is the work of Drs. Czapski, von Rohr, and Eppenstein.

References are brought up to the middle of 1902. Thus amongst electrical instruments the Dolezalek electrometer finds a place; the large amount of recent work on the properties of dielectrics is very amply discussed, including the double-refracting properties for electric waves. Great stress is laid on the important advances made in the construction and standardisation of standard cells.

The optical portion is wholly occupied with geometric optics and applications to optical instruments. The fact that the writers are connected with the firm of Zeiss is a sufficient guarantee of the quality of their contributions. The only regret that one feels in glancing through the book is that the tremendous

amount of material to be dealt with makes compression a *sine qua non*. It is only a taste we get; but the voluminous references to original sources forming the extensive footnotes point the way to a fuller feast. It is as a reference book that the chief value of the volume will be found; it is not intended for consecutive reading.

Each paragraph is a highly condensed account of a particular part of the subject. Thus von Rohr concentrates into a few pages the principal facts treated at more adequate length in his treatise on photographic objectives.

Again, von Seidel's method for dealing with the aberrations of lenses is limited to what seems very scanty treatment when the importance of the method is taken into consideration. But for fuller information the author is obliged to refer to a forthcoming work by A. König and himself—there is only room for outlines in a work like the present.

The work throughout is produced with the thoroughness which is characteristic of German publications. We look forward to the completion of the entire book.

*Laboratory Exercises in Physical Chemistry.* By Frederick H. Getman. Pp. viii+241. (New York: Wiley and Sons; London: Chapman and Hall, Ltd., 1904.) Price 8s. 6d. net.

THE title of this book might lead one to expect that what is really a distinct want had at length been met. Beyond the title, however, there is little in it that merits favourable comment; both in conception and in execution it is most inadequate. One finds, for example, that viscosity and surface-tension are accorded fourteen pages, of which four are purely theoretical and wholly out of place, whilst solubility is disposed of in four and a half pages. Again, we discover molecular volume in the chapter on thermometry, and polarimetry in the chapter entitled "The Spectroscope"! Not only is the author hopelessly deficient in the general sense of proportion and arrangement, but in matters of detail he is equally at fault. He actually (p. 30) introduces the temperature correction of the barometer into the calculation of a vapour density by Victor Meyer's method—the only method given—and does not even succeed in doing it correctly. He defines the unit of resistance as the international ohm (p. 153), and then gives his data in terms of the Siemens mercury unit (p. 172), which is never defined or even mentioned. Turning to his practical instructions we encounter the same thoughtlessness and omission of important details. The student who carried out a series of conductivity measurements at different dilutions according to the instructions on p. 177, for example, would obtain truly wonderful results, for no mention is made of the necessity of having two pipettes so adjusted that one withdraws exactly the same volume as the other delivers. What, again, is a student to make of the instruction on p. 178—"About 20 c.c. of a  $N/32$  solution of pure sodium hydroxide is titrated with the dry acid of which the basicity is sought"? These instances suffice.

In closing the volume one can only express the hope that there may speedily be forthcoming a book which shall be in fact what this is in pretension.

*Les Animaux domestiques.* By J. Anglais. Pp. 103; illustrated. (Paris: Schleicher Frères et Cie., 1904.) THE object of this volume may be best described by paraphrasing the first portion of the introduction, where Dr. Anglais states that it has been his aim, with the aid of a number of ingeniously planned coloured plates, to describe the essential characteristics, both external and internal, of a certain limited number of

types of our most familiar domesticated animals. It is addressed to all who desire to make themselves acquainted with the leading features and characteristics of such animals, without the drudgery of long and profound practical study, and to acquire a general idea of their physiology and the history and object of their subjugation by man. As many details as possible of the peculiarities of the external form and of the internal anatomy are displayed in the illustrations and described in the text, so that it is hoped the work will serve in the case of some readers as an epitome of comparative anatomy and morphology, while for others it may form a starting point for more detailed study. The animals selected for illustration are the horse, the cow, the sheep, the pig, the dog, the cock, and the goose, each being illustrated and described on the same plan.

The illustrations of each species are five in number, and are printed on both sides of the cards, which are cut out to the shape of the animal, and so arranged as to fold over one another. The first shows the external form, the second the skeleton, the third the vascular system, the fourth the muscles, and the fifth the nervous system and viscera.

So far as anatomy can be learnt by means of diagrams, the work appears to deserve all that is claimed for it, and it will probably prove of considerable assistance to artists. Whether all the subjects selected for illustration would meet with commendation at the hands of breeders may, perhaps, be open to question.

R. L.

#### LETTERS TO THE EDITOR.

*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]*

##### Traction of Carriages.

IN tentative answer to your correspondent, p. 270, I suggest the following:—

The best angle of traction on a rough or irregular surface is at an upward inclination to its general slope. This upward slanting pull can be applied to a two-wheeled vehicle, and to the fore-wheels of any vehicle, but not to the hind wheels—especially if they are far away.

Consider, further, the summit of a hill, and let a waggon be so elongated that its hind wheels are still ascending while the horse is descending: his pull is exerted at a very bad angle on this part of the load, and in extreme cases the hill might almost act as a detent.

I should like to take the opportunity of saying that whether the traditional heavy draught of a long-bodied carriage is well founded or not, I am convinced that the ordinary hansom cab is badly balanced, and that a horse would be better with some load on his back, except when descending a hill. The comfort of a wheelbarrow over a balanced cart is considerable.

Though it may be easy to overdo the loading, nothing can be worse than a constant upward pressure on the chest of a horse: a pressure which at present automatically increases on an up grade, thus tending to deprive the animal of part of his own weight, on the existence of which the efficacy of every locomotive depends.

OLIVER LODGE.

##### Lobster Hatching.

PERHAPS your readers interested in economic marine biology may care to know, as a small contribution to the record of times and seasons, that the berried-lobsters kept at the Port Erin Biological Station started hatching out their young on July 15. So far the loss after hatching has been under 1 per cent. We find the best food for the young lobsters to be finely teased up fresh liver of the common shore crabs.

W. A. HERDMAN.

Biological Station, Port Erin, Isle of Man, July 22.